

**CLAIMS**

1. A process of obtaining increased yield and/or a reduced reaction time in enzymatic conversion of lactose to lactobionic acid, said process comprising:

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- i) adding to a dairy substrate a carbohydrate oxidase,
- ii) incubating said dairy substrate under conditions allowing the carbohydrate oxidase to convert lactose to lactobionic acid
- iii) maintaining pH at a stable level during incubation by addition of a base, provided that when a strong base is added said stable level is not a pH of 7.0, and thereby obtaining said increased yield and/or reduced reaction time.

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2. The process according to claim 1 further comprising the step of purifying the lactobionic acid to obtain a substantially pure lactobionic acid product.

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3. The process according to any of claims 1 or 2 further comprising the step of re-using the carbohydrate oxidase added in step i) for a new batch.

4. The process according to any of the preceding claims, wherein the base is a weak base

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5. The process according to claim 4, wherein the weak base is  $\text{Na}_2\text{CO}_3$  or  $\text{NH}_4\text{OH}$

6. The process according any of the preceding claims, wherein the dairy substrate is milk and the base is  $\text{CaOH}_2$ .

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7. The process according to any of the preceding claims, wherein pH in step iii) is maintained by adding the base during a time period that is sufficient to obtain a degree of conversion of lactose to lactobionic acid that is at least 2.5 % higher than in a comparative control process wherein pH is not maintained during incubation.

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8. The process according to any of the preceding claims, wherein the dairy substrate is milk, whey or fractions of whey or a lactose solution/suspension.

9. The process according to any the preceding claims, wherein the carbohydrate oxidase is a microbial carbohydrate oxidase.

10. The process according to claim 9, wherein the carbohydrate oxidase is a carbohydrate oxidase obtained from a fungus belonging to the genus *Microdochium*, more preferably wherein the fungus is *Microdochium nivale* and even more preferably wherein the fungus is *Microdochium nivale* CBS 100236.

11. The process of any of the preceding claims, wherein the amount of oxidase used is in the range from 0.1 to 1000 OXU per kg of dairy substrate, more preferably from 1 to 500 OXU per kg of dairy substrate, and even more preferably from 5 to 100 OXU per kg of dairy substrate.

12. The process according to any of the preceding claims, wherein the conditions in step ii) is selected from the group consisting of temperature, addition of oxygen, amount and type of carbohydrate oxidase, amount and type of catalase and time

13. The process according to claim 12, wherein the temperature is in the range of 0°C to 80°C.

14. The process according to any of the preceding claims, wherein pH in step iii) is maintained, by adequate addition of a base for a period of time sufficient to obtain a degree of conversion of lactose to lactobionic acid that is at least 5% higher than in a comparative control process where the only comparative difference is that during the incubation the pH is not maintained by adequate addition of a base, more preferably at least 15% higher than in the comparative control process, even more preferably at least 30% higher than in the comparative control process and most preferably at least 45% higher than in the comparative control process.

15. The process according to any of the preceding claims, wherein the pH is maintained, by adequate addition of a base, at a pH from about 3.0 to 6.9 and from 7.1 to about 9.0, more preferably at a pH from 5 to 6.9 and from 7.1 to 8.

16. The process according to any of the preceding claims, wherein the pH is maintained at a stable pH from the beginning of the enzymatic reaction, when 95% of the desired conversion has been achieved the pH is allowed to drop to a desired level.

17. The process of any of the preceding claims, wherein the pH is maintained at the stable pH level for a time period that at least last until the oxygen level of the incubated dairy substrate has returned to more than 90% of the initial level.

5 18. The process of any of the preceding claims, wherein the pH is maintained at the stable pH level as described herein for a time period from 30 minutes to 48 hours, more preferably from 1 hour to 36 hours and even more preferably from 2 hours to 24 hours.

19. The process of any of the preceding claims, wherein a catalase is added in step (i) of the  
10 process in an amount that decreases the amount of  $H_2O_2$  produced during conversion of lactose.

20. The process of claim 19, wherein the amount of catalase added is in an amount sufficient to obtain an at least 10% decrease in the concentration of  $H_2O_2$  as compared to a control process where the only comparative difference is that catalase is not added.

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21. The process of claims 19 or 20, wherein essentially all of the suitable amount of oxygen required in step (ii) is obtained by extra addition of a suitable amount of  $H_2O_2$  and wherein the catalase generates the required oxygen from the available  $H_2O_2$ .

20 22. The process of any of the preceding claims, wherein an optional purification results in a composition comprising at least 30% lactobionic acid or at least 90% lactobionic acid.

23. The process of any of the preceding claims, wherein a starter culture comprising lactic acid bacteria is included in the process and wherein the starter culture may be added to the dairy substrate before or after the oxidase is added.  
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24. A process for obtaining increased yield and/or a reduced reaction time in enzymatic conversion of lactose to lactobionic acid comprising:

- i) adding to a dairy substrate a carbohydrate oxidase and a catalase,
- 30 ii) incubating said dairy substrate under conditions allowing the carbohydrate oxidase to convert lactose to lactobionic acid,
- iii) maintaining pH at a stable level during incubation by addition of a base, and thereby obtain said increased yield and/or reduced reaction time.

25. A process according to any of claims 1 to 24 as an integrated part of a food manufacturing process.

26. The process of claim 24, wherein the food manufacturing process is process for manufacturing of a dairy product such as a yoghurt, a milk such as e.g. a calcium fortified milk and a cheese such as process cheese (e.g. for pizza), cream cheese and cottage cheese.